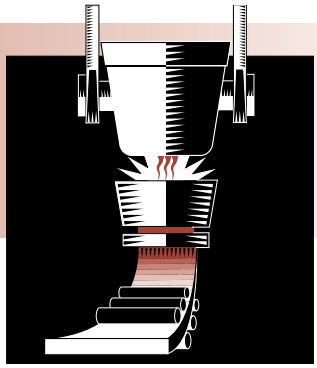
STEEL

Project Fact Sheet



Controlled Thermo-Mechanical Processing (CTMP) of Tubes and Pipes for Enhanced Manufacturing and Performance

Benefits

- Reduced scrap and rework
- Reduced post-processing heat treatments
- Reduced alloy content
- Reduced tooling and machining costs with increased performance
- Reduced toxic wastes
- Reduced greenhouse gas emissions
- Reduced energy consumption
- Increased productivity

Applications

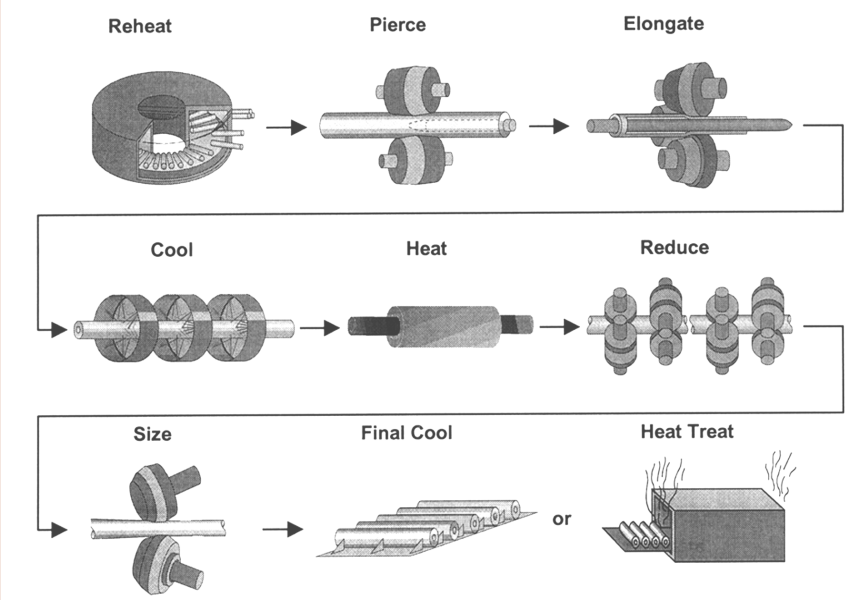
The CTMP technology has the potential for widespread application in all major sectors of the domestic tube and pipe industry; two of the largest sectors are seamless mechanical tubing and seamless oil country tubular goods. Potential applications also exist in the smaller sectors of seamless line pipe, pressure tubing, and stainless tubing. The technology could also apply to non-ferrous metal industries such as titanium.

Innovative hot deformation technology will yield tubular product with microstructure tailored for application

A coalition of steel companies and national laboratories is working with process and equipment experts to develop a system for tube and pipe making to generate targeted microstructures. The system will combine metallurgical fundamental studies, models of the thermal and deformation processes, and product performance response relationships into an integrated model. The objective is to identify a target application and, hence, the desired microstructure and have the model prescribe the process parameters required to produce it.

The CTMP product will offer savings to both the producer and user. Savings to the producer will accrue from greater yield from improved product geometry and surface quality, less required post-processing heat treatment, and the potential to reduce alloy content. The user will gain savings from reduced tooling and machining costs, less heat treatment costs, and the potential for improved product performance. An estimated $400 million in cost savings could be realized if CTMP were applied to the 15 million tons of tube and pipe consumed in the U.S. annually.

Tube Making



Schematic of the tube making process.

Project Description

Goal: Develop CTMP practices in an integrated tube making facility to enhance manufacturing and to improve product performance while obtaining associated energy, environmental, and cost benefits.

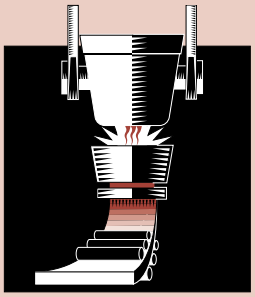
Initial activities include:

- developing models of heat transfer of tubes during the piercing, elongating, and reducing processes during rapid heating and cooling;
- developing material models for microstructural evolution and process modeling;
- developing an integrated process model to simulate thermal, deformation, and microstructural evolution during the tube making process and to predict final microstructure;
- simulating CTMP processes using laboratory equipment;
- developing sophisticated device and system control to achieve the required heating/cooling, deformation, and process rates;
- verifying the selected controlled rolling processes in both laboratory and in-plant tests;
- investigating innovative deformation equipment;
- identifying the microstructures that yield the desired properties for various product applications; and
- developing a system to measure the austenite grain size on-line based on laser ultrasonic technology.

At the end of the first year, a decision will be made regarding continuation of R&D work in a pilot plant incorporating new equipment and alternate processing.

Progress and Milestones

- Project start date, September 1999.
- Cooperative Agreement signed, September 1999.
- Partnerships established, March 2000.
- Continuation of R&D to Pilot Plant Stage decided, September 2000.
- Project completion date, September 2004.



Project Partners

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